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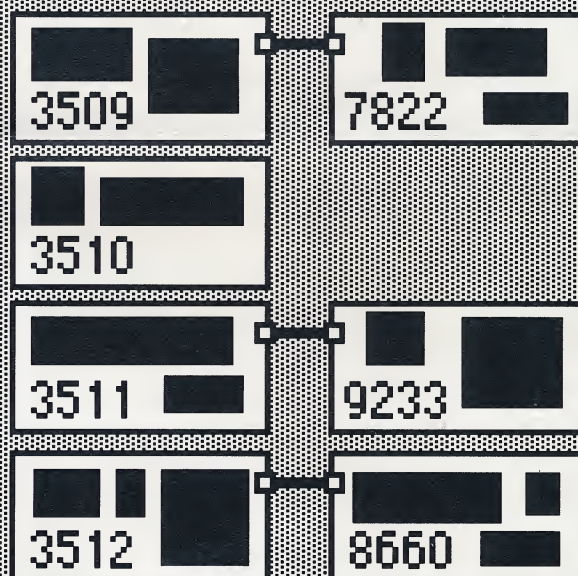
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Issue Number 27

June 1986



The Myth of Separation = 1

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The Myth of Separation=1

If you want to correctly allocate a file on a Pick system, you must choose values for two special file parameters called the "modulo" and the "separation". Most discussions about choosing the modulo (including articles presented in prior issues of *Pragma* and *Pragma's Product Profiles*) generally ignore separation and simply suggest that it should be set equal to one. Why is that, and is it really the right thing to do?

To answer that question, let's first review exactly what the modulo and separation are. When a file is first created, the modulo specifies the number of "groups" in the file. A group is just a collection of disk "frames", where each frame is a block of disk space capable of holding 500 characters of data. (Your particular version of the operating system may use frames of a slightly different size.) The separation for a new file specifies the number of frames to be initially reserved for each group. Therefore, the total number of frames required for a newly created empty file always equals modulo x separation. For example, a file with modulo=3 and separation=1 would consist of three groups with one frame in each group:

Group 1	Frame 2692
Group 2	Frame 2693
Group 3	Frame 2694

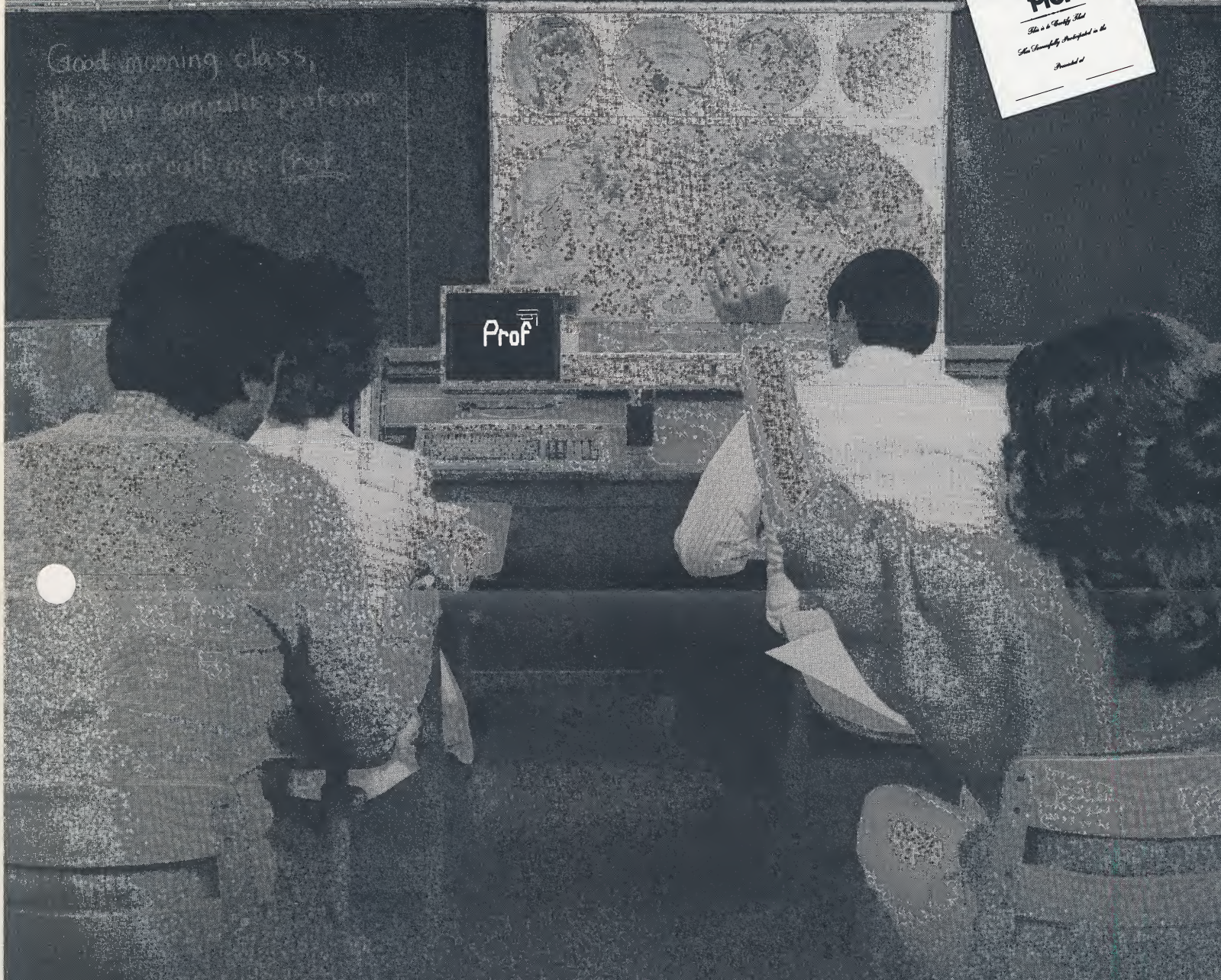
Notice that each frame has its own unique frame number, indicating its position among the thousands of frames on disk. As another example, a file with modulo=3 and separation=2 would require a total of six frames, consisting of three groups, with two frames in each group:

Group 1	Frame 3509	Frame 3510
Group 2	Frame 3511	Frame 3512
Group 3	Frame 3513	Frame 3514

Notice that after a file is created, its frames are always sequentially numbered from the first frame in the first group to the last frame in the last group. That means the frames physically follow one another on the disk and form one contiguous

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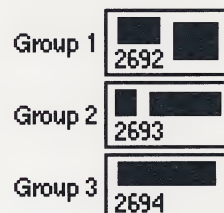
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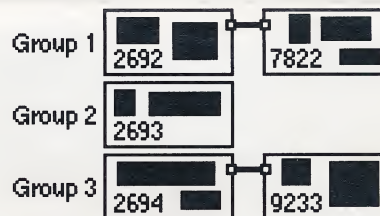
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chunk of disk space.

Once the file has been created, data items can be saved in the file. For each data item, the operating system automatically determines in what group the item should be stored. (See *How Files Grow* in *Product Profiles #22* for an explanation of how that is done.) For example, here is our file with modulo=3 and separation=1, containing five data items of various sizes:

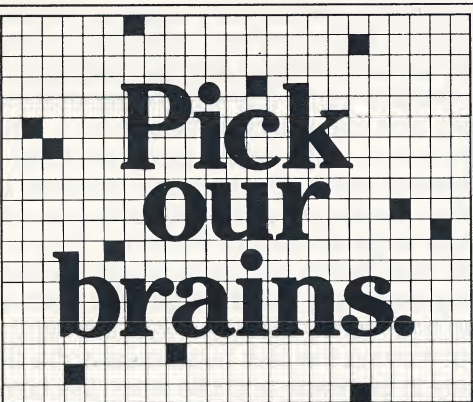


As more items are saved in the file, a group eventually "overflows" its single frame, since a frame can only hold 500 characters of data. When overflow occurs, the operating system automatically finds another available disk frame and remembers a special "link" to the new empty frame in order to logically extend the group and provide enough space for the items that overflowed. For example, here is the same file (modulo=3, separation=1) after groups 1 and 3 have both overflowed:



Notice that an overflow frame linked onto a group can have any frame number. As a result, a sequential search through every item in the above file will cause the operating system to read frames 2692, 7822, 2693, 2694, and 9233, in that order. Because frames are physically stored in sequential order, the disk will have to physically move its recording "head" from frame 2692 to 7822, then back to 2693, and so on. But if the file had used separation=2 like the first example, the original frames would hold all the items, no linking would have been necessary, only a contiguous set of six frames would have to be read (3509 to 3514), and no disk head movement would have to occur, since the frames are all one right after the other on the disk.

Because moving the disk head is a slow mechanical operation, it would seem that avoiding head movement by using separation=2 in the above example would save the computer a lot of time and improve throughput. However, most discussions about modulo and separation will claim that on an interactive timesharing



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**Pragma
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To determine just how much of a difference a properly selected separation can make, we examined an existing data file on our system with a modulo of 387. The file contained an average of 829 characters of data per group, so almost every group consisted of two frames. Since our file was initially allocated with separation=1, the second frame of every group had been chosen from the available disk space and linked on by the operating system. As a result, sequentially searching through the file caused the disk head to move every other frame.

```
001 PQ
002 HTIME
003 P
004 HCOUNT DATAFILE
005 P
006 HTIME
007 P
```

The moral: don't just use a separation of one. If a file's groups occupy more than one frame, let the separation equal the actual frames per group. Your system will enjoy improved throughput. Δ

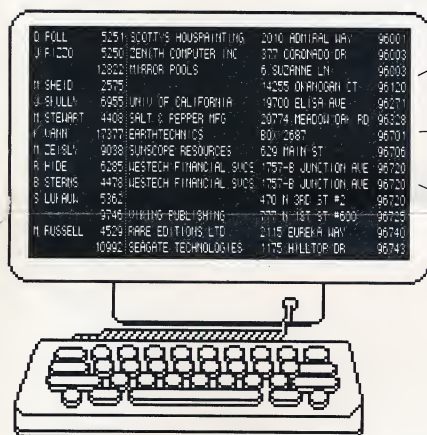
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